

High-Fidelity Testbed

High-fidelity experimentation allows control, protection, and communication infrastructures to exist in a realistic environment that can mimic real-world distribution system operation modes, failure modes, and vulnerabilities to be assessed. Rigorous experimentation can be enabled for power grids by coupling real-time simulators with a wide range of industrial equipment, a rich cloudstack, and scripted automation sequences.



**RESILIENCE THROUGH
DATA-DRIVEN, INTELLIGENTLY
DESIGNED CONTROL (RD2C)**
@PNNL

Hardware-in-the-loop (HIL) approaches allow a real-time distribution model to be interfaced with a range of protection and control equipment. By also building a cyber layer that can capture the interactions between the power grid and the ancillary equipment, a cyber-physical twin can be realized. By allowing automation and orchestration, the twin can be subjected to a range of adverse conditions, operation modes, and novel controls—all while capturing valuable data on both the cyber and physical levels.

